

## Low-Stress Iridium Coatings for Thin-Shell X-Ray Telescopes, Phase I

Completed Technology Project (2009 - 2009)



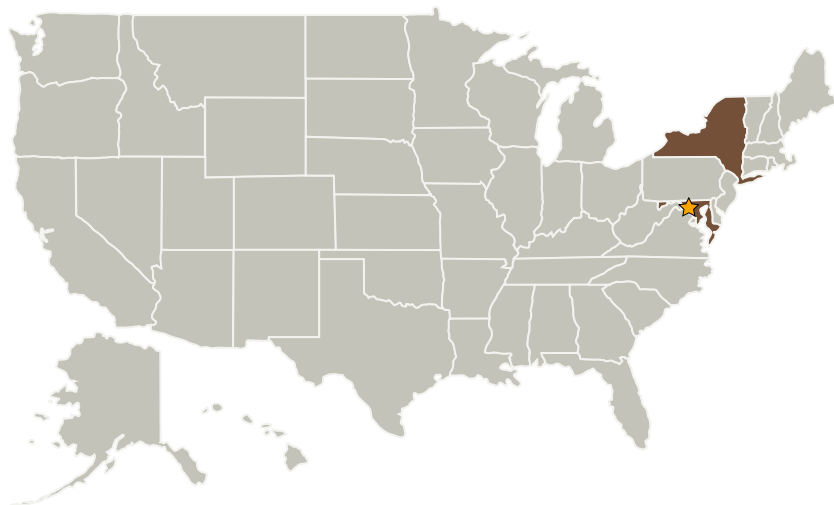
## Project Introduction

We propose to develop and commercialize a new type of low-stress iridium (Ir) X-ray mirror coating technology that can be used for the construction of high-resolution X-ray telescopes comprising thin-shell mirror substrates, such as the Soft X-ray Telescope (SXT) currently being developed for the Constellation-X mission. The urgent need for low-stress Ir coating technology is driven by the current limitations on telescope angular resolution resulting from substrate distortions caused by conventional reflective Ir coatings that have high stress. In particular, we have measured film stresses in excess of 3 GPa in the case of 30 nm Ir films deposited by conventional magnetron sputtering techniques. The distortions in thin glass mirror shells (such as those suitable for the Constellation-X SXT) resulting from these extremely large coating stresses presently make the largest contribution to the SXT telescope imaging error budget, of order 10 arcsec or more. Consequently, it will be difficult, if not impossible, to meet the imaging requirements of Constellation-X, or other future high-resolution X-ray missions, unless high-quality Ir coatings having significantly lower stresses can be developed. The development of such coatings is precisely the aim of our proposal.

## Anticipated Benefits

Low-stress Ir X-ray coatings may also find application in non-NASA applications, such as diagnostic medical and homeland security (i.e., baggage and cargo screening) X-ray imaging. The low-stress Ir coatings we propose to develop will be suitable for use in the Constellation-X SXT instrument, as well as other future NASA X-ray telescopes comprising thin shell mirror elements.

## Primary U.S. Work Locations and Key Partners



Low-Stress Iridium Coatings for Thin-Shell X-Ray Telescopes, Phase I

## Table of Contents

Project Introduction	1
Anticipated Benefits	1
Primary U.S. Work Locations and Key Partners	1
Organizational Responsibility	2
Project Management	2
Technology Maturity (TRL)	3
Technology Areas	3

## Low-Stress Iridium Coatings for Thin-Shell X-Ray Telescopes, Phase I



Completed Technology Project (2009 - 2009)

Organizations Performing Work	Role	Type	Location
★Goddard Space Flight Center(GSFC)	Lead Organization	NASA Center	Greenbelt, Maryland
Reflective X-Ray Optics LLC	Supporting Organization	Industry	New York, New York

Primary U.S. Work Locations	
Maryland	New York

## Organizational Responsibility

**Responsible Mission Directorate:**

Space Technology Mission Directorate (STMD)

**Lead Center / Facility:**

Goddard Space Flight Center (GSFC)

**Responsible Program:**

Small Business Innovation Research/Small Business Tech Transfer

## Project Management

**Program Director:**

Jason L Kessler

**Program Manager:**

Carlos Torrez

**Project Manager:**

Peter N Blake

**Principal Investigator:**

David Windt

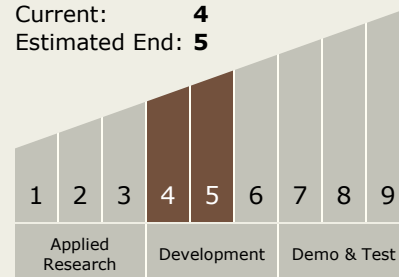
## Low-Stress Iridium Coatings for Thin-Shell X-Ray Telescopes, Phase I

Completed Technology Project (2009 - 2009)



### Technology Maturity (TRL)

Start: **4**  
Current: **4**  
Estimated End: **5**



### Technology Areas

#### Primary:

- TX08 Sensors and Instruments
  - └ TX08.2 Observatories
    - └ TX08.2.1 Mirror Systems